Chapter 1

Background, Objectives, and Methodology of the Study

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Chapter 1

Background, Objectives, and Methodology of the Study

1. Background

Electricity demand in the ASEAN region is increasing as the region's economy grows steadily. Thus, power plant development should proceed towards a well-balanced optimal generation mix with coal, gas, and renewables to address the surging demand.

Coal and liquefied natural gas (LNG) are still the main energy sources for surging economic expansion in some ASEAN member states (AMSs) because of their affordability and reliability despite the worldwide decarbonisation trend. According to the Sixth ASEAN Energy Outlook published in 2020, renewables' capacity and share will remarkably increase with total energy demand. Fossil energy, such as coal and LNG, also increases even in the modal case of the ASEAN target scenario.

While the energy situation is quite different in the AMSs, most countries must facilitate a carbon-neutral policy, even if they mainly use fossil energy in this energy transition era. A stepwise transition by experienced clean coal technology (CCT) might be a practical way for these countries.

In October 2020, Japan's then-Prime Minister Yoshihide Suga unveiled a major shift in Japan's climate change position: the country now aims to become a carbon-neutral society by 2050. To materialise a carbon-neutral society, the Government of Japan aggressively facilitates energy improvement of the current CCT and research and development (R&D) of the next generation's CCT, carbon capture and storage (CCS), carbon capture, usage, and storage (CCUS), and carbon recycling.

This study proposes a set of tailor-made and optimal carbon-neutral solutions for each AMS, such as (i) combustion types (e.g. biomass cofiring, ammonia cofiring, hydrogen combustion, boiler types, such as ultra-super critical (USC), advance ultra-supercritical (A-USC), integrated coal gasification combined cycle (IGCC), IGCC + fuel cell (IGFC) equipped with environmental facilities; and (ii) operation techniques (e.g. flexibilisation measures). It also provides a comprehensive proposal by combining CCT. That is, combustion technologies and CO_2 storage/conversion technologies will be studied.

2. Objectives

The study aims to provide the following recommendations to support ASEAN in the energy transition.

1) By-country carbon-neutral solutions with CCT and relevant carbon-recycling technologies and measures
2) Carbon-neutral solutions with CCT and relevant carbon-recycling technologies and measures applicable to ASEAN
3) By-country and regional policy recommendations to be conducive to the energy transition efforts by ASEAN and respective AMSs.

3. Methodology

1) Formulation of by-country strategies for technology introduction, implementation, and sharing

The study focuses on identifying and formulating by-country strategies to facilitate the introduction, implementation, and sharing of technology:

- Electronic communication with Working Group (WG) members for information and advice to develop the optimal strategy for each target AMS
- Collective discussions at the two-time WG meetings as referred to 2) below
- Internet surveys to enhance the accuracy of the strategies to be formulated.

2) Working Group activities

- Establish a working group of members from the central governments and major public institutions in the respective target countries to identify issues and barriers to promoting the carbon-neutral policy. The members will present the current energy situation, CO_2 emission volume, and CCT roadmap. The study team (the Team) will give a basic idea of suitable and adaptable CCT for each country.
- Based on the data provided by members and the Team, all participants will discuss the direction for further study by the Team. Technology suppliers will join the technical discussions.

3) Technical study by the Team

- The study team will analyse the data provided through the WG and any data from the public domain to make a map using the energy policy, CO_2 volume, and transition potential of conventional to the latest CCT in each country.
- Combustion types, such as biomass cofiring; ammonia cofiring; hydrogen combustion, boiler types such as USC, A-USC, IGCC, and IGFC equipped with environmental facilities, and operation techniques, such as flexibilisation measures are considered in this study.

- Based on the discussion and technical study, the study team will work out a comprehensive and optimal CCT solution proposal for a carbon-neutral society.

First WG meeting: Discussion on topics such as potential technology introduction in each AMS, issues to be addressed, envisaged best practices, policy measures to be taken, benefits and advantages, etc.

Second WG meeting: Presentation by JCOAL of the draft report covering proposals for each AMS.

4. Expected Recommendations

The following recommendations will be provided to support ASEAN in the energy transition:

1) By-country carbon-neutral solutions with CCT and relevant carbon-recycling technologies and measures
2) Carbon-neutral solutions with CCT and relevant carbon-recycling technologies and measures applicable to ASEAN
3) By-country and regional policy recommendations to be conducive to the energy transition efforts by ASEAN and respective AMSs.